National Institute of Environmental Health Sciences

The British river of the future: How climate change and human activity might affect two contrasting river ecosystems in England

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Abstract:

The possible effects of changing climate on a southern and a north-eastern English river (the Thames and the Yorkshire Ouse, respectively) were examined in relation to water and ecological quality throughout the food web. The CLASSIC hydrological model, driven by output from the Hadley Centre climate model (HadCM3), based on IPCC low and high CO(2) emission scenarios for 2080 were used as the basis for the analysis. Compared to current conditions, the CLASSIC model predicted lower flows for both rivers, in all seasons except winter. Such an outcome would lead to longer residence times (by up to a month in the Thames), with nutrient, organic and biological contaminant concentrations elevated by 70-100% pro-rata, assuming sewage treatment effectiveness remains unchanged. Greater opportunities for phytoplankton growth will arise, and this may be significant in the Thames. Warmer winters and milder springs will favour riverine birds and increase the recruitment of many coarse fish species. However, warm, slow-flowing, shallower water would increase the incidence of fish diseases. These changing conditions would make southern UK rivers in general a less favourable habitat for some species of fish, such as the Atlantic salmon (Salmo salar). Accidental or deliberate, introductions of alien macrophytes and fish may change the range of species in the rivers. In some areas, it is possible that a concurrence of different pressures may give rise to the temporary loss of ecosystem services, such as providing acceptable quality water for humans and industry. An increasing demand for water in southern England due to an expanding population, a possibly reduced flow due to climate change, together with the Water Framework Directive obligation to maintain water quality, will put extreme pressure on river ecosystems, such as the Thames.

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Resource Description

Climate Scenario :

specification of climate scenario (set of assumptions about future states related to climate)

Other Climate Scenario

Other Climate Scenario: UKCIP02 scenarios

Communication:

resource focus on research or methods on how to communicate or frame issues on climate change; surveys of attitudes, knowledge, beliefs about climate change

A focus of content

Communication Audience: ☑

audience to whom the resource is directed

Policymaker

Other Communication Audience: Environmental managers

Exposure : ☑

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Food/Water Quality

Food/Water Quality: Pathogen

Geographic Feature: ☑

resource focuses on specific type of geography

Freshwater

Geographic Location: ☑

resource focuses on specific location

Non-United States

Non-United States: Europe

European Region/Country: European Country

Other European Country : England

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Foodborne/Waterborne Disease

Foodborne/Waterborne Disease: General Foodborne/Waterborne Disease

Mitigation/Adaptation: ☑

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology: ☑

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Resource Type: ☑

format or standard characteristic of resource

Review

Resilience:

capacity of an individual, community, or institution to dynamically and effectively respond or adapt to shifting climate impact circumstances while continuing to function

A focus of content

Timescale:

time period studied

Long-Term (>50 years)

Vulnerability/Impact Assessment:

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content